REMARKS

Applicant acknowledges the First Office Action of 29 AUG. 2002, and requests reconsideration of the claims, as amended. Claim 10 has been amended, as helpfully suggested by the Examiner. Claims 4, 7, 14, and 19-21 have been cancelled.

Before discussing of the references, a brief review of certain significant features of the present invention may be helpful. As discussed on page 4 of the specification, demand for liquid crystal displays with faster refresh rates and consistent luminance has promoted substitution of **aluminum** wiring layers for the previously-used **chrome** wiring layers. However, it has recently been recognized that a **tradeoff** is involved here, with wiring resistance decreasing but contact resistance tending to increase, often to undesirable values. Such increases in contact resistance are partly caused by oxidation of the aluminum or aluminum alloy surface, but the present invention teaches how such oxidation can be reduced or eliminated. As discussed at the end of the present specification, such limitation of the contact resistance facilitates production of liquid crystal displays which minimize signal delays caused by contact resistance, and thereby provide a desirably even luminance across the LCD.

Claim Rejections

Claims 1-12 and 14-21 were rejected under section 102 as anticipated by DOHJO+/TOSHIBA (USP 6,078,366). That rejection is moot, in view of the incorporation into the independent claims of the "Markush group" set forth in the specification at page 10, lines 9-10, and page 14, lines 13-14.

Claim 13 was rejected under section 103 as obvious over a proposed combination of DOHJO with SAKATA/MITSUBISHI-ADVANCED DISPLAY (USP 6,252,247). It should be noted that the present invention is assigned to ADVANCED DISPLAY INC., a part-owner of the SAKATA patent. The Office has suggested that it would have been obvious, at the time the present invention was made (prior to JUNE 2000), to modify the DOHJO structure with the nitridating feature of SAKATA (issued 2001), to thereby obtain a good contact resistance in the DOHJO structure. However, there is nothing in DOHJO to suggest the desirability of such a combination.

Before one can arrive at a **solution**, one must first appreciate the **nature of the problem**. Although DOHJO col. 15, lines 35-39, discuss the fact that AL is a low-resistance material, and there are references at col. 10, line 51, col. 12, line 63, col. 12, lines 11 & 34, col. 15, line 25, and col. 16, last line, to using aluminum-yttrium alloy scanning lines, DOHJO nowhere distinguishes between **wiring** resistance and **contact** resistance, or suggests that doping

the aluminum alloy would solve any (apparently unrecognized) contact resistance problem. Rather, DOHJO's primary objectives are (col. 1, line 63) achieving high aperture ratio, (col. 2, line 7) avoiding interlayer short-circuiting, and (col. 9, lines 8-14) suppressing variations in scanning-line capacitance arising from mask placement deviations during manufacturing. DOHJO's main proposal to minimize resistance is to **use lots of contact holes**, spaced "preferably less than 20 micrometers, for example; more preferably, less than 15 micrometers" (col. 26, lines 39-40). Thus, DOHJO does not appreciate the nature of the contact resistance problem, and does not suggest combination with another disclosure to solve the (essentially metallurgical) problem.

Forming the extended scanning line and extending auxiliary capacitance line only of the same conductive film as for the signal line (Cr or Mo or Ta), a lower total resistance along the scanning line is obtained without suffering from high contact resistance at the terminal ends of those lines. **DOHJO** uses low resistivity metal (Al) again in the terminal region (111a of scanning pad 152 in Fig. 1 and Fig. 7), resulting in **high contact resistance**.

By contrast, in accordance with the present invention, a same conducting film for signal line (Cr or Mo or Ta) used for the extending line and the extending auxiliary capacitance line, having a high melting point metal, is at the same time mechanically hard and corrosion-resistant. Mechanical hardness and corrosion resistance of those metals help to avoid breakage of those lines.

Conclusion

In view of the foregoing amendment and comments, it is respectfully submitted that claims 1-3, and their respective dependent claims, are allowable. If the Examiner detects any remaining informalities which need to be corrected to place the application in condition for allowance, a telephone call to Applicant's counsel is invited. It is noted that **no objection** to the drawings has been made and that **receipt** of the priority document JP 2000-183 034 **has been acknowledged**.

If any extension or additional fee is necessary, please construe this paper as a Petition therefor, and charge the fee to Deposit Account 23-0442.

Respectfully submitted,

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Enclosure: VERSION MARKED TO SHOW CHANGES MADE
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VERSION MARKED TO SHOW CHANGES MADE

1. (Amended) An array substrate comprising:

a display area in which pixel electrode are formed,

a scanning line formed of a low resistivity metal, said scanning line being arranged between then pixel electrodes,

a signal line formed of a high melting point metal selected from the group consisting of chrome, molybdenum, tantalum and alloys thereof, said signal line crossing over the scanning line interposing an insulating layer therebetween,

a terminal to which a scanning signal is applied, and

an extended scanning line [formed from a conductive film] for connecting the scanning line with the terminal, said extended scanning line being formed only of the same conductive film as for said signal line.

[wherein the conductive film for the extended scanning line and that for the scanning line are of different layers.]

2. (Amended) The array substrate of claim 1 comprising:

an auxiliary capacitance line arranged parallel to the scanning line,

a collected auxiliary capacitance line arranged in parallel to the signal line and electrically connected to the auxiliary capacitance line,

a terminal to which a common signal is applied, and

an extended auxiliary capacitance line [formed from a conductive film] for connecting the collected auxiliary capacitance line with the terminal for the common signal, said extended auxiliary capacitance line being formed only of the same conductive film as for said signal line.

[wherein the conductive film for the extended auxiliary capacitance line and that for the collected auxiliary capacitance

line are of different layers.]

3. (Amended) An array substrate comprising:

a display area in which pixel electrodes are formed,

a scanning line formed of a low resistivity metal, said scanning line being arranged between the pixel electrodes,

an auxiliary capacitance line arranged in parallel to the scanning line,

a signal line formed of a high melting point metal selected from the group consisting of chrome, molybdenum, tantalum and alloys thereof, said signal line crossing over the scanning line and the auxiliary capacitance line interposing an insulating layer therebetween,

a collected auxiliary capacitance line arranged in parallel to the signal line and electrically connected to the auxiliary capacitance line,

a terminal to which a common signal is applied, and

an extended auxiliary capacitance line for [formed from a conductive film] connecting the collected auxiliary capacitance line with the terminal, said extended auxiliary capacitance line being formed only of the same conductive film as for said signal line.

[wherein the connected film for the extended auxiliary capacitance line and that for the collected auxiliary capacitance line are of different layers.]

4. (cancelled)

5. (amended) The array substrate of claim 1, wherein the extended scanning line is formed only of the same conductive film as for the pixel electrodes, instead of the same conductive film as for said signal line [and the pixel electrodes are formed from the conductive film of same layer].

7. (canceled)

8. (amended) The array substrate of claim 2, wherein the extended auxiliary capacitance line is formed only of the same conductive film as for the [and the] pixel electrodes, instead of the same conductive film as for the signal line. [are formed of from the conductive film of same layer.]

9. (amended) The array substrate of claim 8 [7], wherein the extended auxiliary capacitance line is electrically connected to the collected auxiliary capacitance line at the neighborhood of the display area and electrically connected to the terminal for the common signal at the neighborhood of the terminal.

10. (Amended) The array substrate of claim 2, wherein the auxiliary capacitance line, the [corrected] collected auxiliary capacitance line and the scanning line are formed from the conductive film of same layer.